Reg. No ..... Name **26U506**-S

B. Sc. DEGREE END SEMESTER (SAY) EXAMINATION - MAY 2026

SEMESTER 5 : PHYSICS

COURSE : **19U5CRPHY06 : CLASSICAL AND QUANTUM MECHANICS**

(For Supplementary (SAY) 2023 Admission)

Time : Three Hours Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. Determine the number of degrees of freedom in the following cases i) three particles connected by three rigid massless rods ii) 3 particles moving freely in space.
2. What is the value of probabilty current density, when the wave function is real.
3. Characterise, well behaved wave functions.
4. Show that Planck's radiation law reduces to Rayleigh Jean's law at low frequencies
5. Differentiate, commuting and anti commuting operators
6. What is the importance of Davisson Germer experiment.
7. Explain the principle of superpostion of states.
8. Mention the advantages of Lagrangian approach over Newtonian approach.
9. Define linear operator. Explain with example.
10. Briefly explain the principle of virtual work.

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. Derive the Hamilton's equations of motion.
12. Find the probability that a particle trapped in a box L wide can be found between 0.45L and 0.55 L for the first excited state.
13. Determine the de-Broglie wavelength of an electron accelerated through a potential difference of 100v
14. Calculate the group and phase velocity of a proton , whose de- Broglie wavelength is 1 nm.
15. Check whether the operator, (iħx ð/ ðx) is Hermitian.
16. State and explain D'Alembert's principle.
17. An electron in a one dimensional infinte potential well goes from n=4 to n=2 level, the frequency of emitted photon is 3.43×10^{14} Hz. Find the width of the box.
18. Show that size of hydrogen atom is a direct consequence of uncertainty principle.

(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. Out line different postulates of quantum mechanics.
20. Derive the Schrodinger equation and energy eigen values for a particle trapped in a infinite potential well of length L
21. Using Lagrange's equations arrive at the equations of motion for (a) simple pendulum and (b) a linear harmonic oscillator.
22. Deduce Planck's radiation law for black body radiation spectrum.

(10 x 2 = 20)